

# A NEW SCANNING PROTOCOL FOR BLACK & WHITE NEGATIVES

## OVERVIEW

Over the past few years, marine mammal researchers specializing in photo-identification studies have begun exploring the use of high-resolution digital SLR cameras. As we move from traditional photography methods to digital still formats, it is important to convert existing images on negatives or slides to high-resolution digital formats so the images can be included in databases and transferred easily among researchers. The scanner we tested is the Nikon Super CoolScan 4000 ED Film and Slide Scanner<sup>1</sup>. Before scanning, always dust the negative with negative brush. Don't use canned air because the propellant in the can may coat the negative with a chemical.

When comparing results of different settings on the scanner, always print out comparative images on a high-resolution photo printer (at least 2880x720 dpi) on photo paper to look for differences. Some of the nuanced differences are very obvious on the printed page, but somewhat obscure even on the best computer monitor (e.g., high resolution 22" CRT monitor). When we were comparing settings, we asked at least 3 and sometimes 4 different people to look at a set of variations of the same scanned negative and tell us which image displayed the fine marks in the best fashion. The tests were always conducted as "blind" tests; i.e., the subjects did not know if we were testing color space, film type, bit depth, multi-sampling, etc.

### IN THE COOLSCAN PREVIEW WINDOW:

Settings: Always Reset to Factory Defaults, then do all the setup as described below. When you have finished adjusting all the settings, save your settings with a unique name (e.g., "negative (color)" as shown in the window on the right).

### Adjust Film Type:    **Neg (Color)**

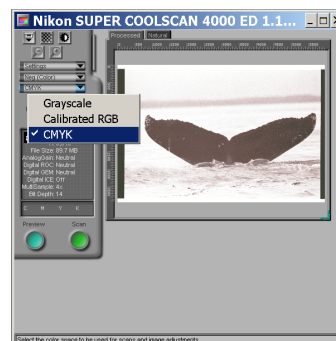
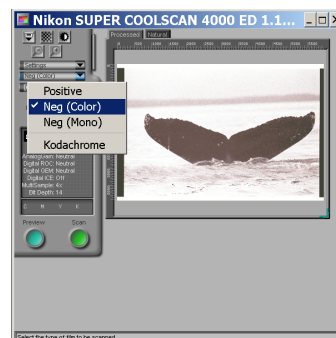
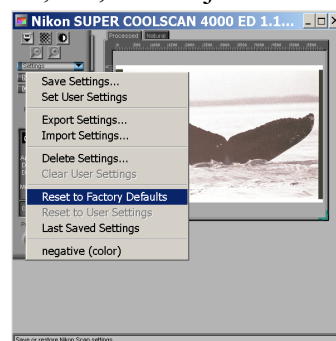
Use the Negative (Color) option, even when using black and white film; testing has shown that this setting gives more defined details in the image, compared to the *Negative (Mono)* option. We have not tested this option with positive or Kodachrome film.

### Color Space:    **CMYK**

*Grayscale* does not give enough definition on the trailing edge or on the fine markings on the flukes. The picture is somewhat blurry compared to RGB and CMYK.

*RGB* gives a good quality picture, with a well-defined trailing edge. The markings on the fluke are more defined than scanning with grayscale. However, the details on the fluke do not contain as much edge definition and depth as CMYK.

CMYK gives the best image. The marks on the fluke contain more depth and definition.



<sup>1</sup> Use of this or any other product name does not imply that NOAA endorses this product.

## IN THE TOOL PALETTE 1 WINDOW:

### Crop

- Keep this crop: W: 5,959 x H: 3,946

This is the highest resolution setting for the Nikon Coolscan 4000. The numbers represent the size of the picture in pixels horizontally and vertically. If you rotate the image 90 degrees, the crop switches to a width of 3,946 and height of 5,959.

- Resolution: 4,000 Pixels/Inch

Scan the image at maximum resolution in order to capture the finest detail of the image. The file size at these settings will be around 87 to 91 MB. After the image is scanned, use an editing program (e.g., ACDSee 6.0) to change to 256 grays (file size reduces to 22.9 Mb), then crop, and make other fine adjustments in image densities (gamma) and contrast (see p. 7).

### Curves and LCH editor

Our initial testing involved making adjustments using both the curves (CMYK color curve) and LCH editor (mainly Lightness, not Chroma and Hue). After extensive testing, we found that we got the most consistent adjustments by changing the Lightness on the LCH editor (see below) and by not adjusting the color curves at all.

✗ **Disable Color Balance (click on the ✓)**

✗ **Disable Unsharp Mask (click on the ✓)**

Do not sharpen the image when scanning. Unsharp Mask increases contrast at the edges, which give the illusion that the image is sharper. When magnified, the edges of fine marks that have been processed with Unsharp Mask look LESS sharp than on the original images. Also, the use of Unsharp Mask can amplify “noise”, which can result in adding artificial data to the image.

### Digital ICE cubed

#### Do not enable Digital Ice (Image Correction Enhancement)

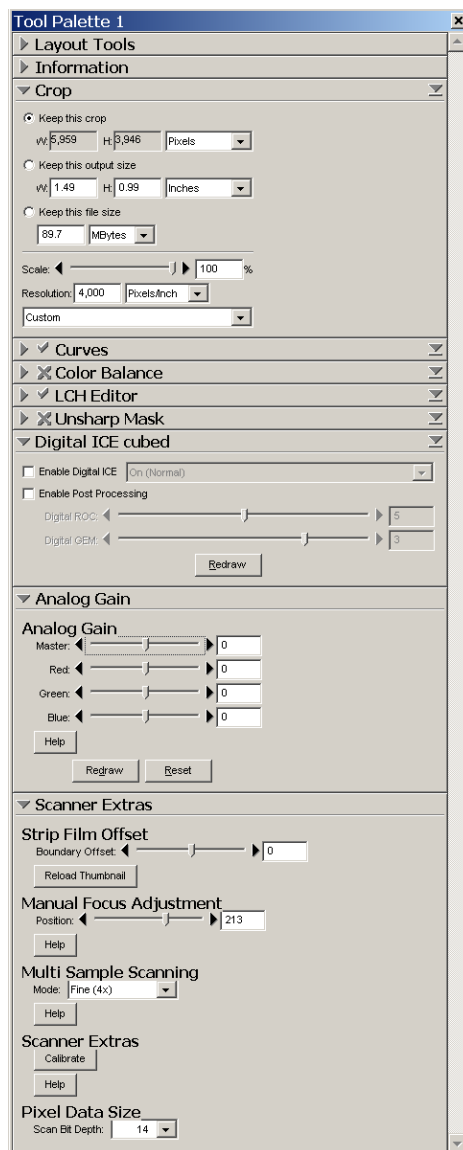
Digital Ice removes very fine scratches or barely visible dust, but we tested and found that Digital Ice can reduce sharpness of the image. Also, Digital Ice does not work well on black and white film or Kodachrome because of the nature of the layering on the film emulsion. If the negative or slide is in good shape, use a negative brush to dust the slide or negative before using Digital Ice.

Do not enable **Post Processing**

Digital ROC (Recovery or Restoration of Color)

Digital GEM (Grain Equalization and Management)

GEM eliminates visible grain and softens the hard edges of an image; the result will be a decrease in sharpness.



## Analog Gain (do not adjust)

### Scanner Extras

Manual Focus Adjustment: Never manual focus. Use the auto focus instead of adjusting focus manually. Auto focus each time film is inserted.

#### Multi Sample Scanning: Fine 4x

We tested the Multi Sample setting and found that multi-sampling at 1x did not reveal all the details contained in the negative and multi-sampling at 16x increased noise (extra marks and artifacts) in the image. Multi-sampling at 4x gave the best image with the least amount of noise and an intermediate scanning time:

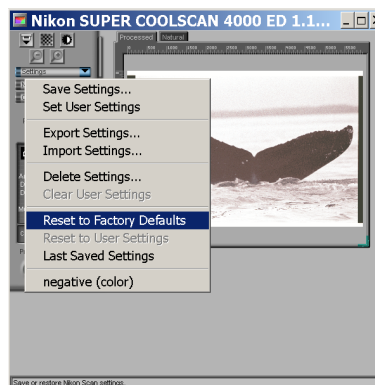
Multi sample	Scanning Time	Result
Normal (1x)	00:39	Less detail
Fine (2x)	01:10	Good detail, but not enough
<b>Fine (4x)</b>	<b>02:20</b>	<b>Better detail</b>
Super Fine (8x)	04:38	Better detail, but some noise
Super Fine (16x)	10:38	Produced noise on the image

#### Pixel Data Size: 14

A scan bit depth of 14 is the highest setting for this scanner. The higher the bit depth, the more color information is retained in each pixel with greater precision, which gives a higher dynamic range and more accurate colors. We have found that doing the initial scans in a color space and converting the image to 256 grays in post processing allows us to capture a larger dynamic range of the texture and edges of the marks, scars and pigments.

#### ***IN THE COOLSCAN PREVIEW WINDOW:***

Settings: When you have finished adjusting all the settings, save your settings with a unique name (e.g., “negative (color)” as shown in the window on the right).



## SCANNING ADJUSTMENTS FOR SHOWING FINE MARKS AND PIGMENTS FOR PHOTO-ID

Insert the negative and look at the preview. If you use a filmstrip loader (we have had good success with this), select the thumbnail of the image you want to scan.

Unless the negative is an excellent, full frame shot, we zoom in on the image and adjust the densities of the zoomed portion.

- Fig A and B: Zoom to a smaller portion of the image.
- Fig C: Run preview again.
- Adjust image densities using the Lightness curve in the LCH viewer (see next section).
- Fig D: Zoom back out and double-click to remove zoom window.
- Scan the image and save it.
- Edit in ACDSee 6.0 (or equivalent photo editor) to crop, rotate, and adjust contrast and gamma.

Fig A. Full View with Zoom Box

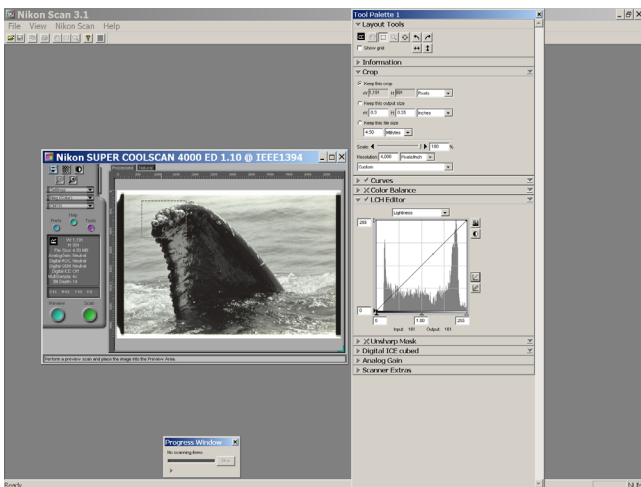


Fig B. Zoomed area, before running preview

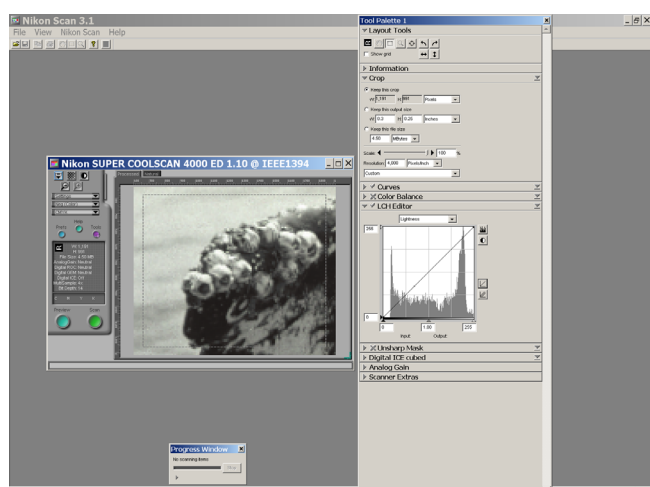


Fig C. Zoomed area after running preview

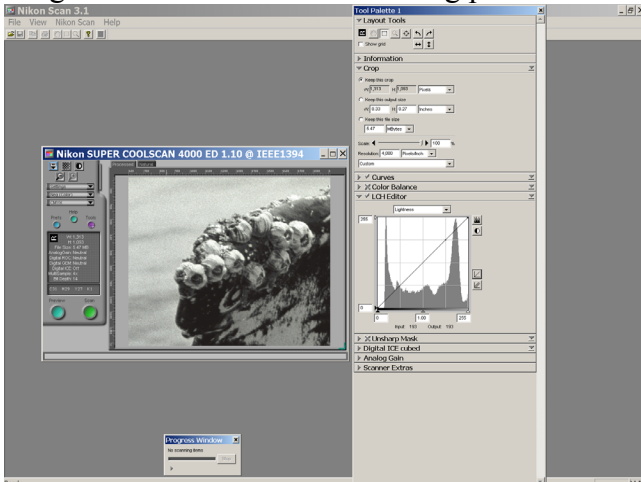
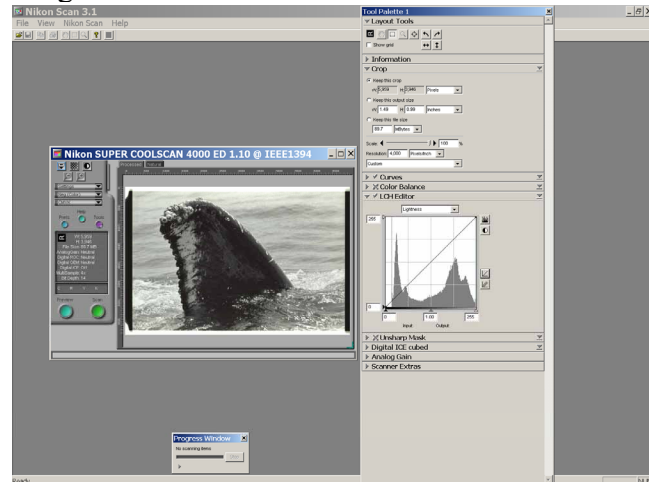


Fig D. Full View



## SCANNING ADJUSTMENTS FOR SHOWING FINE MARKS AND PIGMENTS FOR PHOTO-ID

### IN THE TOOL PALETTE 1 WINDOW:

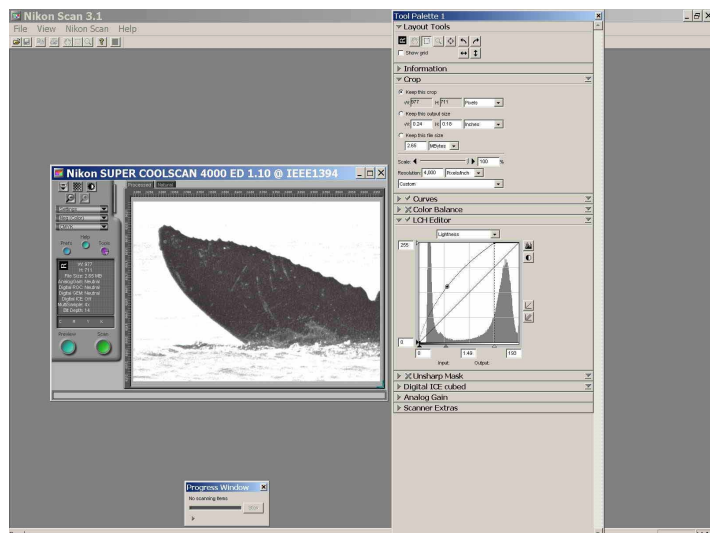
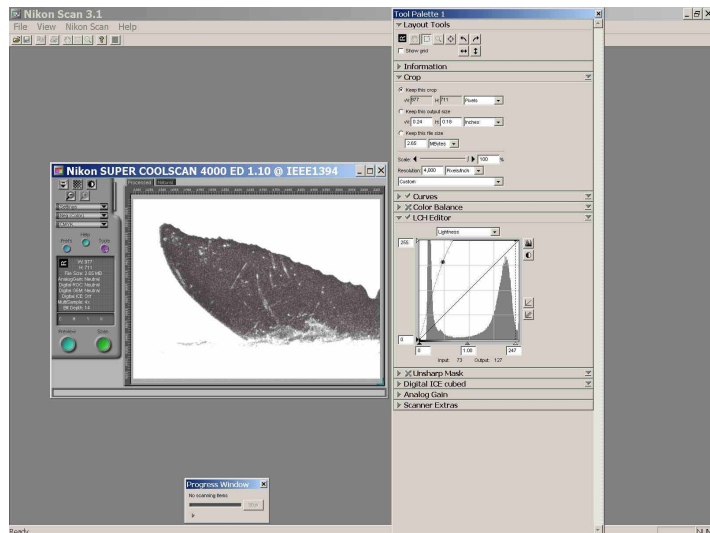
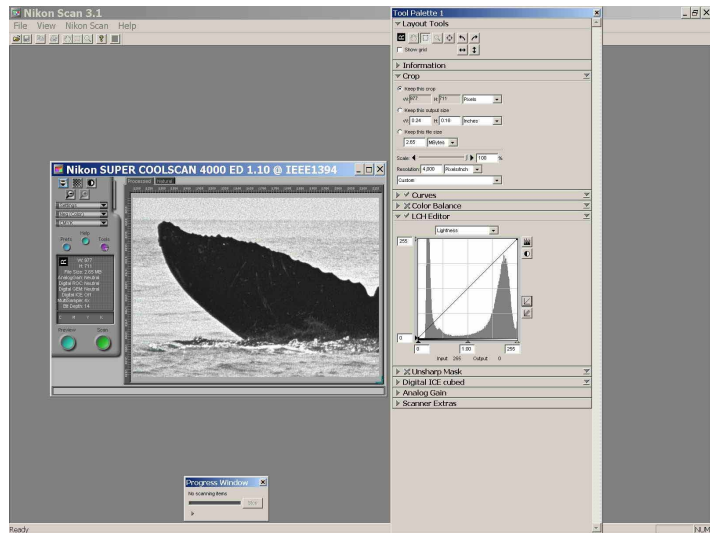
LCH Editor (Lightness, Chroma and Hue)

After testing, we have found that we get best results by only adjusting Lightness. Chroma and Hue adjustments don't help with adjusting the image densities, fine marks and pigments.

The top graphic shows the original negative preview. We adjust the Lightness of the image by grabbing the diagonal line in the middle in the LCH editor (make sure Lightness is selected in the top box).

The middle graphic shows an image that has been lightened too much. Note the position of the curved dotted line and the position of the circle in the middle (the circle is at the spot that was originally grabbed).

The bottom graphic shows an image that is a good compromise of lightening enough to show fine marks without lightening too much. If you lighten too much, you lose the grayish details.

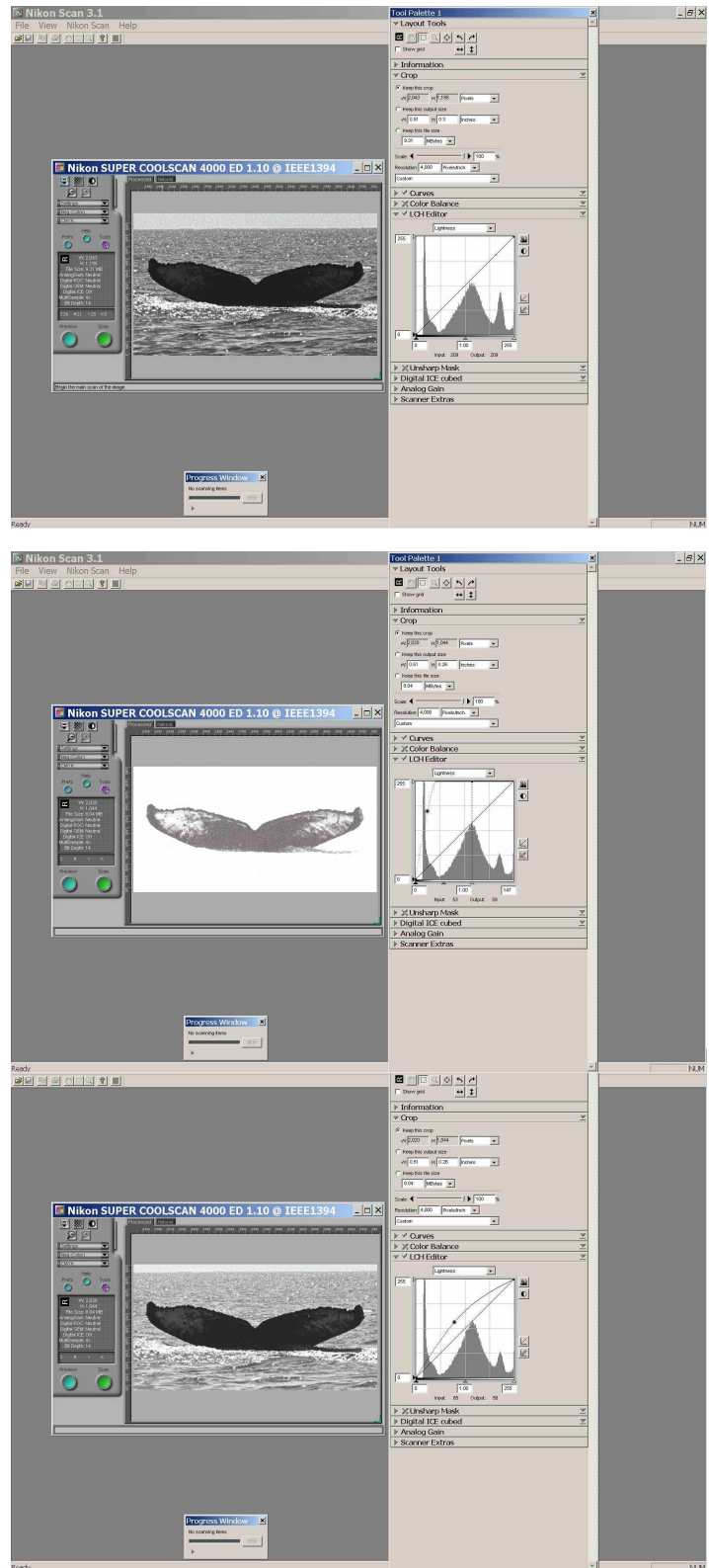


## SCANNING ADJUSTMENTS FOR SHOWING FINE MARKS AND PIGMENTS FOR PHOTO-ID

The top graphic shows the original negative preview. The image is too dark and doesn't show the true nature of the pigment patterns and fine marks and scars.

The middle graphic shows an image that has been lightened too much. The pigment pattern shows well enough, but the fine marks and lightest grays on the image do not show. Note the position of the curved dotted line and the position of the circle in the middle (the circle is at the spot that was originally grabbed).

The bottom graphic shows the best density for this negative. We've adjusted the image by grabbing the curve (note the curve shown) and by grabbing the gray (middle) slider at the bottom of the density histogram.



## EXAMPLES OF SCANNING RESULTS FOR NEGATIVES TAKEN AT DIFFERENT DISTANCES

The original scanned image file has an approximate size of 89 Mb. File size is reduced to 22.9 Mb when we convert the image to 256 grays. Cropping to center and enlarge the tail flukes to fill the image frame reduces the file size even more.

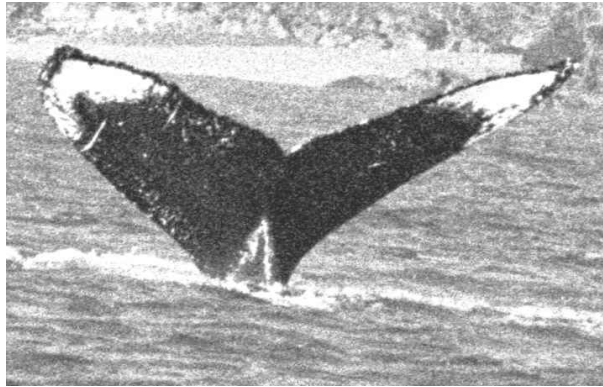
***Far Distance Shot***

Full Frame



256 grays, 22.9 Mb

Enlarged



256 grays, 302 Kb

***Medium Distance Shot***

Full Frame



256 grays, 22.3 Mb

Enlarged



256 grays, 2 Mb

***Close-up Shot***

Full Frame



256 grays, 22.3 Mb

Enlarged



256 grays, 8.6 Mb